HES 411 Research Methods in Nursing

Week 1 handout: What is research, and how do we choose who to study?

COHECASE Mamfe | Level 400 Nursing

Name: _____ Matricule: _____ Date: _____

After today you should be able to

1. Say in one sentence what research is.
2. Explain population, sample and sampling frame using a health facility in Manyu.
3. Choose a sample using simple random, systematic and stratified sampling.
4. Work out a sample size with Cochran's formula.

1. What is research?

Standard definitions (Polit & Beck, 2021)
Research: "Systematic inquiry that uses disciplined methods to answer questions or solve problems."
Nursing research: "Systematic inquiry designed to develop trustworthy evidence about issues of importance to the nursing profession."

In simple words, research means asking a clear question and finding the answer in a careful, organised way that someone else could repeat. A detective does the same thing: collects clues, checks them, and reaches a conclusion that can be defended. In research the clues are called data.

Feeling or research?
"I feel this dressing works better" is an opinion.
"I used this dressing on 60 patients and 48 healed within two weeks" is a research finding.

Nurses need research so that care is based on proof and not on habit. It makes patients safer, it helps us solve ward problems such as falls or missed drugs, and it is the skill you will use in your final-year project (HES 414).

The research journey in 7 steps

Step	What you do	Example: malaria drugs in Mamfe
1. Ask	Write a clear question	Do malaria patients in Mamfe who get health teaching finish their drugs more often?
2. Read	Find what others have already found	Read published studies on health teaching and drug adherence
3. Plan	Decide who, how many, and how	Choose the patients and how to check adherence

4. Collect	Gather the data	Count leftover tablets at the follow-up visit
5. Analyse	Work with the numbers	Compare the two groups
6. Present	Show the results	A table or a graph
7. Use	Change practice	Make health teaching part of every malaria consultation

2. Population and sample: the eru pot rule

You do not need to eat a whole pot of eru to know if it needs salt. One spoon is enough, as long as you stir the pot first. If the salt and crayfish have settled at the bottom and you taste from the top, your spoon lies to you. The pot is the population, the spoon is the sample, and stirring means choosing the sample fairly so that every part of the pot has a chance to end up in the spoon.

Read the standard definition first, then the simple meaning. Definitions are from the glossary of Polit and Beck (2021).

Term	Standard definition	In simple words	Mamfe example
Population	The entire set of individuals or objects having some common characteristics.	Everyone you want to know about	Pregnant women
Target population	The entire population in which a researcher is interested and to which he or she would like to generalize the study results.	The group your answer will apply to	All pregnant women in Manyu Division
Accessible population	The population of people available for a particular study; often a nonrandom subset of the target population.	The part you can actually reach	Women attending ANC at Mamfe District Hospital
Sampling	The process of selecting a portion of the population to represent the entire population.	Choosing who to study	Choosing 80 women from the ANC register
Sample	A subset of a population comprising those selected to participate in a study.	The people you actually study	The 80 women you interview
Sampling frame	A list of all the elements in the population, from which a sample is drawn.	The list you pick from	The ANC register at Mamfe District Hospital
Element	The most basic unit of a population for sampling purposes, typically a human being.	One person in the population	One pregnant woman
Representative sample	A sample whose characteristics are highly similar to those of the population from which it is drawn.	A small copy of the whole group	Women from town and villages, young and older
Sampling bias	Distortions that arise when a sample is not representative of the population from which it was drawn.	The sample leans to one side	Interviewing only women from Mamfe town

Remember
Big N = population size. Small n = sample size.

If you study the whole population, that is called a census.

Why not study everybody? It takes too long, it costs too much (okada fares to Eyumojock or Tinto, printing, phone credit), some tests use up what they test (you cannot test every blood bag), and a smaller group lets you collect data more carefully.

A good sample is representative: it looks like a small copy of the population. A biased sample leans to one side. If you study access to care in Manyu but only interview people in Mamfe town on market day, villages like Tinto and Kembong are left out and your answer will look better than reality. That is like tasting eru only from the top of an unstirred pot.

3. How to pick a fair sample

Sampling methods come in two families. In probability sampling everyone has a known chance of being chosen (a fair lottery). In non-probability sampling the researcher decides who gets in. Examples of non-probability sampling are convenience (whoever is there), purposive (chosen for a reason), snowball (one person refers the next) and quota (filling fixed numbers). This course concentrates on three probability methods.

Term	Standard definition (Polit & Beck, 2021)	In simple words
Probability sampling	The selection of sampling units from a population using random procedures.	Chance decides
Nonprobability sampling	The selection of sampling units from a population using nonrandom procedures.	The researcher decides
Simple random sampling	Basic probability sampling involving the selection of sample members from a sampling frame through completely random procedures.	Lottery from the full list
Systematic sampling	The selection of sample members such that every kth (e.g., every 10th) person or element in a sampling frame is chosen.	Every k-th person
Strata	Subdivisions of the population according to some characteristic.	Groups
Stratified random sampling	The random selection of study participants from two or more strata of the population independently.	Groups first, then lottery

A. Simple random sampling (the lottery)

Every person has the same chance of being picked.

5. Get the list of everyone (the sampling frame), for example our class list.
6. Give each person a number.
7. Draw numbers by lottery, a random number table, Excel =RANDBETWEEN(1,100), or a phone app.
8. The people whose numbers are drawn are your sample.

Good to know: It is the fairest method, but you need a complete list.

B. Systematic sampling (every k-th person)

Formula
$k = N \div n$ (k is the sampling interval, the "jump")

Example: there are 500 files at the hospital records office and you need 50. $k = 500 \div 50 = 10$. Pick a random start between 1 and 10, say 7. Then take files 7, 17, 27, 37 and so on up to 497.

Trap: If the list has a repeating pattern, you may pick the same kind of person every time. For example, if every 7th day is a Sunday and k = 7, you could end up with only Sundays.

C. Stratified sampling (groups first, then lottery)

Split the population into groups that do not overlap (strata), then use simple random sampling inside each group. In proportional stratified sampling each group gets the same percentage. Example: imagine 600 mothers living in three areas around Mamfe.

Group (stratum)	Number of mothers	10% sample
Mamfe town	300	30
Besongabang	200	20
Egbekaw	100	10
Total	600	60

This makes sure small groups, like Egbekaw here, are not left out by accident. You must know which group each person belongs to.

Memory line
Lottery (simple random). Jump (systematic). Groups (stratified).

4. How many people do I need?

Too small a sample and the results could be luck. Too big and you waste time and money, or give up halfway. You need a bigger sample when people differ a lot from each other, when you want a very precise answer or more confidence, and when many people may refuse.

Cochran's formula
$n = Z^2 \times p \times (1 - p) \div d^2$
Z = confidence. For 95% confidence, Z = 1.96
p = expected proportion. If you do not know it, use 0.5
d = margin of error you accept, usually 0.05
Sources: Cochran (1977); Lwanga and Lemeshow (1991), WHO manual

Worked example: $n = 1.96 \times 1.96 \times 0.5 \times 0.5 \div (0.05 \times 0.05) = 0.9604 \div 0.0025 = 384.16$. Always round up, so n = 385. You cannot interview 0.16 of a person, and rounding down would leave you short.

Two adjustments

Small population. If the whole population is small, use n adj = n ÷ (1 + (n − 1) ÷ N). If the ANC register has only N = 500 women: 384.16 ÷ (1 + 383.16 ÷ 500) = 384.16 ÷ 1.766 = 217.5, so 218.

Refusals. If you expect 10% to refuse, divide by 0.9. 218 ÷ 0.9 = 242.2, so plan to approach 243 women.

5. Real research from Mamfe and our region

These studies are published and free to read online. Each one shows a sampling idea from today.

Study	What they did	Lesson for us
Tarkang and Pencille (2018), Pan African Medical Journal	A stratified sample of 254 road construction workers at sites along the Kumba-Mamfe road.	Stratified sampling used in our own region.
Ngomtcho et al. (2024), BMC Infectious Diseases	165 blood donors at Mamfe District Hospital, recruited by consecutive sampling.	Consecutive sampling is non-probability: every donor who came in was taken.
Mekolle et al. (2023), BMC Health Services Research	Data taken from the registers of Mamfe District Hospital, April 2021 to June 2022.	Hospital registers can serve as a sampling frame and a data source.

6. Practice (answers on the last page)

All numbers in this handout are invented for practice. They are not real figures from any facility in Mamfe.

9. A student watches only morning-shift maternity nurses to study hand washing at Mamfe District Hospital. Name the population and the sample. Is the sample biased?
10. There are 300 mothers in the ANC register at Mamfe District Hospital and you need 30. What is k? If your random start is 4, list the first four mothers chosen.
11. Imagine COHECASE Mamfe has 400 students: 160 in Level 200, 140 in Level 300 and 100 in Level 400. You need 40. How many from each level?
12. Calculate Cochran's n for 95% confidence, p = 0.5 and d = 0.10.
13. Which method fits best: (a) choosing every 5th patient in the OPD queue at Mamfe District Hospital, (b) names drawn from a hat, (c) splitting nurses by ward and drawing from each ward?

Key points

- Research is a clear question answered in an organised, repeatable way.
- Population (N) is everyone; sample (n) is the group you study; the sampling frame is the list you pick from.
- Simple random = lottery. Systematic = every k-th, with k = N ÷ n and a random start. Stratified = groups first, then random within each group.

- Cochran: $n = Z^2p(1 - p) \div d^2$. With 95% confidence, p = 0.5 and d = 0.05, n = 385.
- Always round a sample size up.

References and further reading

Polit, D. F., & Beck, C. T. (2021). Nursing research: Generating and assessing evidence for nursing practice (11th ed.). Wolters Kluwer.

Gray, J. R., & Grove, S. K. (2021). Burns and Grove's the practice of nursing research: Appraisal, synthesis, and generation of evidence (9th ed.). Elsevier.

LoBiondo-Wood, G., & Haber, J. (2022). Nursing research: Methods and critical appraisal for evidence-based practice (10th ed.). Elsevier.

Cochran, W. G. (1977). Sampling techniques (3rd ed.). John Wiley & Sons.

Lwanga, S. K., & Lemeshow, S. (1991). Sample size determination in health studies: A practical manual. World Health Organization. Free on WHO IRIS.

Tarkang, E. E., & Pencille, L. B. (2018). Psychosocial predictors of consistent condom use among migrant road construction workers in the Southwest Region of Cameroon using the Health Belief Model. Pan African Medical Journal, 29, 215. https://doi.org/10.11604/pamj.2018.29.215.15130

Ngomtcho, S. C. H., Njike Ngo Biyong, O., Ekwere, T. A., et al. (2024). Trends in immunological markers of transfusion transmissible infections among blood donors in Mamfe District Hospital, Southwest Cameroon. BMC Infectious Diseases, 24, 370. https://doi.org/10.1186/s12879-024-09119-0

Mekolle, E. J., Keumami, K. I., Amadeus, O. A., et al. (2023). Facility-led community based approach in Mamfe health district, Cameroon: a differentiated service delivery option in complex humanitarian settings. BMC Health Services Research, 23, 334. https://doi.org/10.1186/s12913-023-09323-9

Find more: search PubMed (pubmed.ncbi.nlm.nih.gov) or Google Scholar for "Mamfe" or "Manyu" plus your topic.

Homework for next Tuesday

Write one research question from your clinical placement. Bring it to class. Next week: treatment, replication, randomization, experimental unit and experimental error.

Answers to the practice questions

14. Population: all nurses at Mamfe District Hospital. Sample: the morning-shift maternity nurses she watched. Yes, it is biased: other wards and the night shift are left out, and people may wash their hands better when they know they are being watched.
15. k = 300 ÷ 30 = 10. Mothers number 4, 14, 24 and 34.
16. 10% of each level: 16 from Level 200, 14 from Level 300, 10 from Level 400.
17. n = 3.8416 × 0.25 ÷ 0.01 = 96.04, rounded up to 97.
18. (a) systematic, (b) simple random, (c) stratified.